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Construction and research on the flipped classroom model for middle school physical education from the perspective of core competencies

Yamei LI, Zongjue MA*

Xinjiang Normal University, Urumqi 830054, China
*Corresponding Author
Email address: 1156414345@qq.com

Abstract: Against the backdrop of deepening basic education reform, cultivating core competencies in physical education has become a priority in middle school physical education reform. Grounded in constructivist theory and the blended learning concept, this paper constructs a core-competency-oriented flipped classroom teaching model for middle school physical education. By reconstructing the teaching process of "pre-class knowledge internalization—in-class ability enhancement—post-class competency extension", it promotes the coordinated development of motor abilities, health behaviors, and sportsmanship. The study demonstrates that, via digital resource empowerment, differentiated task-driven approaches, and multi-dimensional evaluation feedback, this model can effectively overcome the practical dilemma of "prioritizing skills over competencies" in traditional physical education, thereby providing theoretical reference and practical pathways for the reform of physical education curriculum in the new era.

Keywords: flipped classroom; core competencies in physical education; middle school physical education; blended learning; teaching model construction

1 Introduction

With the promulgation of the *Physical Education and Health Curriculum Standards for Compulsory Education* (2022 Edition), cultivating core competencies in physical education has been established as the central goal of curriculum design. The traditional physical education classroom is constrained by a linear teaching model of "teacher demonstration—student imitation", which suffers from three primary problems: first, skill training dominates classroom hours, whereas health knowledge instruction and character cultivation become mere formalities; second, individual differences among students fail to gain sufficient attention, which in turn tends to dampen students' learning motivation; third, rigid temporal and spatial boundaries of classrooms hinder the integrated design of the "learning—practicing—competing—evaluating" system [1].

The flipped classroom, as a representative paradigm of information-based education, offers a novel approach to resolving these issues by flipping the temporal and spatial processes of knowledge transmission and internalization.

2 Core concepts and theoretical basis

2.1 Three-dimensional deconstruction of core competencies in physical education

The core competencies of physical education consist of three dimensions: "motor abilities", "health behaviors" and "sportsmanship". These three dimensions constitute a spiraling, progressive educational system: Motor abilities serve as the practical foundation, encompassing skill acquisition, physical fitness development, and tactical application, providing the core capacity support for students' participation in physical activities. Health behaviors center on exercise habits, safety awareness, and emotional regulation, aiming to foster students' lifelong awareness of scientific physical activity. Sportsmanship, nurtured via teamwork, rule awareness, and willpower, highlights the unique role of physical education in personality formation and the shaping of values. These three dimensions interpenetrate and progress step by step, jointly facilitating students' comprehensive advancement from "skill acquisition" to "competency generation" [2].

2.2 Adaptability analysis of the flipped classroom

From a theoretical perspective, the flipped classroom exhibits an alignment with the objectives of PE core competencies in three aspects: First, grounded in constructivist learning theory, pre-class independent learning promotes students' meaningful construction of sports principles and health knowledge, reserving practical time for higher-level skill practice and situational application in class. Second, through the layered design of micro-lectures and personalized feedback mechanisms, it accurately identifies differences in students' abilities, thereby enabling targeted breakthroughs in individualized instruction. Third, adhering to the concept of holistic education philosophy, it transcends the single dimension of skill training through diversified in-class and out-of-class activity design, promoting the integrated permeation of motor abilities, health behaviors, and sportsmanship, ultimately achieving all-round competency development.

3 Construction of the core-competency-oriented flipped classroom model for physical education

3.1 Model design principles

The model is designed in accordance with three principles. First is the principle of objective integration, which runs the three-dimensional core competency objectives through the whole teaching design process. For example, in basketball teaching, micro-lectures can simultaneously realize the permeation of tactical coordination (motor ability), sports injury prevention (health behavior), and team collaboration awareness (sportsmanship), achieving the synergistic cultivation of knowledge, ability, and values. Second is the principle of dual-line integration. Relying on a collaborative mechanism of "online knowledge construction—offline practice internalization", the model employs digital resources to support cognitive understanding of sports principles and problem generation, and leverages in-person classrooms to promote skill transfer and competency permeation, forming a closed-loop structure of combining learning with practical application. Third is the principle of evaluation orientation. The model builds a multi-dimensional system combining "process evaluation and performance evaluation", and adopts tools such as classroom observation, skill demonstration, and health logs to dynamically track the development trajectory of students' competencies, ensuring that teaching objectives resonate with educational outcomes [3].

3.2 Three-stage teaching structure design

The three-stage teaching structure revolves around the core logical thread of "knowledge internalization—ability enhancement—competency extension": In the pre-class stage, 5-8 minute thematic micro-lectures integrating animated demonstrations and live-action examples (e.g., "Mechanical principles of standing long jump", "Scientific hydration methods after exercise") are developed to guide students in knowledge construction and question formulation. Progressive task sheets drive students to submit self-assessment reports on health behaviors via an app, enabling precise learning

diagnosis. At the in-class stage, guided by the stratified cyclic practice approach, students are divided into a foundational group (movement correction), an improvement group (combined drills), and an advanced challenge group (practical application) according to pre-class feedback. Meanwhile, competitive scenarios such as "Simulated Olympic Games" and "Obstacle Relay Races" are created to permeate rule awareness and stress resilience cultivation amid in-depth skill training. Critical thinking topics like "Balancing the desire to win and sportsmanship" promote the internalization of values. In the post-class stage, learning extends to life scenarios, using practical tasks such as family exercise plans (e.g., parent-child rope skipping check-ins) and community sports event participation to facilitate the transfer of health behaviors [4].

4 Implementation strategies for the flipped classroom model

4.1 Teacher competency upgrade pathway

The core-competency-oriented flipped classroom model puts forward comprehensive upgrading requirements for PE teachers' professional competencies. In terms of role transformation, teachers need to move beyond the single role of a "skill demonstrator" and advance towards becoming a "learning designer", concretely manifested in the reconstruction of three abilities: First, micro-lecture production ability. Teachers need to integrate principles of sports mechanics, health knowledge graphs, and moral education elements, and adopt multimedia technologies such as animation modeling and live-action filming to develop thematic resources with both scientific rigor and attractive presentation. Second, activity planning ability. Teachers are required to design hierarchical task chains according to core competency goals. For example, integrating basketball tactical training with team leadership development to achieve the organic unity of skill training and character permeation. Third, data analysis ability. Teachers can leverage tools such as smart wristbands and video replay systems to collect student movement data, and accurately assess the learning outcomes through trajectory analysis and heart rate monitoring. At the collaborative mechanism level, an interdisciplinary teaching research community should be established, collaborating with information technology teachers to develop a school-based physical education resource library, for instance, building a digital platform encompassing micro-lectures, 3D motion models, and health cases, and regularly conducting dual-perspective seminars integrating sports science and educational technology to iteratively optimize teaching strategies. Furthermore, by organizing teacher workshops and school-based training activities, a closed-loop capability development model of "design—implementation—reflection" is formed, driving teachers' transformation from experiential practitioners to research-oriented educators.

4.2 Stimulating students' learning motivation

To address low student engagement in conventional physical education, a two-pronged motivational mechanism of "extrinsic incentives—intrinsic motivation" needs to be constructed. First, the learning experience is reshaped through gamification mechanisms. A "sports badge" system is designed based on the characteristics of sports events (e.g., "Track and Field Endurance Badge", "Basketball Assist Star"), where accumulated points entitle students to premium privileges such as the right to use sports equipment or serve as a referee at school events, deeply binding skill improvement with honor incentives. Second, a contract-based learning model is introduced. Based on the SMART principle (Specific, Measurable, Achievable, Relevant, Time-bound), "Autonomous Learning Commitment Letters" are signed by students, specifying weekly exercise duration and health goals (e.g., body fat percentage regulation, emotional management check-ins), supplemented by parental countersignature and peer evaluation mechanisms to enhance goal commitment. Furthermore, through rewards for achieving phased objectives (e.g., granting the "Health Expert Badge") and visualized feedback of sports data (e.g., an app-generated "exercise progress curve"), educators can steadily enhance students' self- efficacy, realizing their transformation from "passive practice" to "active development".

5 Conclusion

The flipped classroom model developed in this study achieves the organic unity of physical education knowledge, skills, and competencies through the restructuring of the teaching process and the innovation of the evaluation mechanism. Future research can further explore the applications of artificial intelligence technology in scenarios such as personalized learning pathway recommendation and intelligent sports posture diagnosis, thereby driving physical education toward more precise and intelligent development.

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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About the author

Zongjue Ma, male, Ph.D., Associate Professor, research direction: Physical Education and Training.